SCIENCE IN DECORATION.

(EXTRACT FROM A LECTURE BY H. BRAIDWOOD.)

ALL the forms in nature and art are composed of straight or curved lines or combinations of them. All the forms, whatever their color may be, are derived from three primary colors, or simple colors—red, blue and yellow. These are called primary colors because they cannot be produced by the mixture of any other colors, whilst all other colors are derived from a mixture of two of these or the three together, unless we consider black and white to be colors also, about which there are some differences of opinion. The question before us is, therefore, a question of forms and colors, and perhaps more of the latter than the former. For that reason it might be well for us to spend a few minutes in contemplating the begining of the science of color. When Newton closed all avenues to the entrance of sunlight into one of his rooms he then bored a hole in a shutter, just enough to admit a ray of light, to which he presented a prism that shattered the white light into its original elements or colors; these Newton threw upon a white screen, and thus brought into existence the celebrated color spectrum, resembling the rainbow, and which this diagram may somewhat represent. The spectrum is a band of color composed of red and yellow with orange between them, of yellow and blue with green between them; the blue then shades away into red rays creating indigo and violet (purple), until the latter is lost in the dark end of the spectrum. These seven colors Newton called the seven primary colors, but subsequent investigation has demonstrated that the orange is caused by the mixture of red and yellow, the green by yellow and blue, and the purple by the red and blue, so that orange, green, and purple are known as secondary colors. And now we come to speak of certain peculiar characteristics of these colors, as well as others derived from mixtures of two or more of them, and there are thousands of these. First, let it be understood that all colors when standing separate from each other are somewhat different than when two or more of them are placed alongside of each other. Any two colored bodies, such as any two of these colored worsteds, when laid side by side, either increases each other's brightness to the extent of 10 per cent., or lessens each other's brightness to the same amount. Certainly this possible gain or loss of 10 per cent. in the appearance of goods offered for sale in our stores is worth considering, especially as it is only necessary to understand what colors will produce the best effects. Here I place this clear bright red piece of wool with this of yellow, when you at once see that the red has lost some of its strength; if I put this purple with it you see it is not as bright at first, but put it with the green, when those of you whose eyes have not been weakened by shiftless observations will be able to see that the red has gained in brightness when placed next to the green. Now, colors that enhance each others value, as do this green and red, are called complementary colors, and as green or red are each without the power to increase the value of any other colors, or these colors to increase the value of them, green and red therefore are mutually complementary; in the same way can it be demonstrated that purple and yellow look best together, as do blue and orange. But it must be understood that these colors must be equal in depth of tone, for it is one of the laws of color as we see it, that dark is complementary to light. Look at these six stripes of gray—all different tones; each stripe colored as evenly flat as possible up to where they touch each other; yet you see that where the stripes join each other they do not appear flat as drawn, but each seems to shade out one from the other. It is the lighter stripe that is made lighter by the nearness to the darker, and, as you see, the darker is made darker by its nearness to the lighter. This diagram for instructing in complementary colors manifests the same law—that of any two bodies not of equal depth of color, the darker will make the lighter appear more light, and the lighter make the darker appear darker still; and thus it comes about that black put alongside of white increases the purity of the latter. But this tendency of black to purify white when put alongside of any other color lowers its tone or brightness, so that if put with light shades of pink, green, purple, yellow, &c., a very perceptible weakening of those is seen to take place. It should not be forgotten by those who care to know that, although red and green, yellow and purple, orange and blue, are complementary colors, if the purple blue and red, be quite dark, and the yellow, orange and green be very light, that the darker that are otherwise complementary will cause a loss of color to the light yellow, orange, and green; while at the same time the colors that have been made lighter by contrast with the darker will react on the darker, making them appear darker still. From all this we formulate the axiom known as the "contrast of tone," which, be it remembered, is quite a different thing from the contrast of color, such as red with green, the first wholly relating to things lighter and darker, and the latter to the color of things only.

Let us turn our attention for a moment or two to this diagram of color, you see its heading reads as showing the primaries, seconaries, and the tertiary. [Our readers can easily make such a diagram for themselves by painting three overlapping circles in primary colors.—ED. D. AND F.] In these three circles we see the primaries; on the other side are three sets of circles overlapping each other, and the space in the center of each caused by the overlapping are seen to be respectively orange, green, and purple. Now, no green, orange, or purple were painted there. Please to look at the central figure formed by three circles overlapping one another (forming an ace of clubs without the handle): one was painted all over with yellow, another with red, another with blue. You observe where the yellow falls upon a part of the red circle that orange is created, and where the yellow falls upon a part of the blue circle that green is the result, and where blue falls upon a part of the red circle you see purple, and where the lines of the three circles cross each other, creating a curved-line triangle in the centre of the figure, the three colored circles falling upon this space have created a brown color called the tertiary, becase it is comprised of the three primaries. You will also notice that the orange is right opposite to the blue, the green opposite to the red, and the yellow opposite to the purple. It is for these reasons that these complementary colors are sometimes called "opposite colors." It may be of interest to know that "brown color" is not found in Newton's color spectrum, and it looks from the arrangment of the colors in the spectrum that it is impossible it could be there, composed as it is of three primaries, as we know them; yet there are many times more brown colored matters on and in the earth than any other color. The structure of those objects that appear to us as brown must be more complex, as they use use three primaries of decomposed sunlight to give out their color, whilst any other colors use but two or one of the primaries. And here is an idea or two connected with the so-called purity of colors. First, it must be understood by our boys and girls who may become designers or painters, or who may have to mix colors for scientific or artistic purposes, that there is no such thing as a pure color known to mankind. But for all that the trained eye can see such colors, and produce the purest of colors from them. For example purple is required. Now, purple, as we know by this time, is made from red and blue. Of course, no yellow is put in, or it would become more or less brown; therefore, a red must be used that is tinged with red. In this way the yellow would be kept out and your secondary would be purer than its components. And so if a green is required, the yellow must be of a blue cast, and its blue tinged with yellow, and not with red; and in like manner would orange have to be composed of a reddish yellow and a red tinged with yellow.

Let us observe those colored cloths, on each of which is a disc of black. In the white light of day the black on the orange would be tinted with blue—the complementary of the orange ground. For a similar reason the black on the orange would be tinted with blue—the complementary of the orange ground. For a similar reason the black on the red would appear green, and the black on the green ground would be red, &c., but in the gaslight the experiment entirely fails. My object was to show that broad flat tints or prevailing tints of any color, such as are often put on our walls and floors, when we enter those apartments (if our sight is developed enough) we will behold the "opposite color" of the prevailing color in the room. A manufacturer of overcoats in Paris furnished a number of pieces of white and dffferent colored cloths, intended for coat linings, to a calico printer to print different patterns on them in black. He did so, using what had been the sort of color for printing black for years; but when the goods were returned to the tailor his eye detected that the black on the blue cloth was orangey, that on orange cloth was tinted with blue, the black on the red appeared to be green, and that on the green ground was red; in a word, the black on each was tarnished by the "complementary" or opposite color" of the ground on which it was printed, whilst the white cloth, having only the power by the law of the "Contrast of Tone," could only make the black blacker. The tailor refused to receive the goods, a lawsuit resulted, the best experts of printing were called, and all testified to the correctness of the black color used in printing being the same that had been used for years; but there the silent goods lay before the Court. The tailor offered to receive the goods if all the blacks on the colored grounds were made like that on the white ground; but the tailor asked for an impossibility. The great chemist Chevreul solved the difficulty by surrounding some of the blacks on the different colored grounds with white paper thereby concealing from observation the colors of the goods on which the black was printed, thus making it impossible for the eye to evolve the opposite or complementary color that it must see when viewing any color more or less in a mass.